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Corporate Financial Leverage in Canadian Manufacturing: Consequences for Employment and Inventories

by Andrew Heisz and Sébastien LaRochelle-Côté

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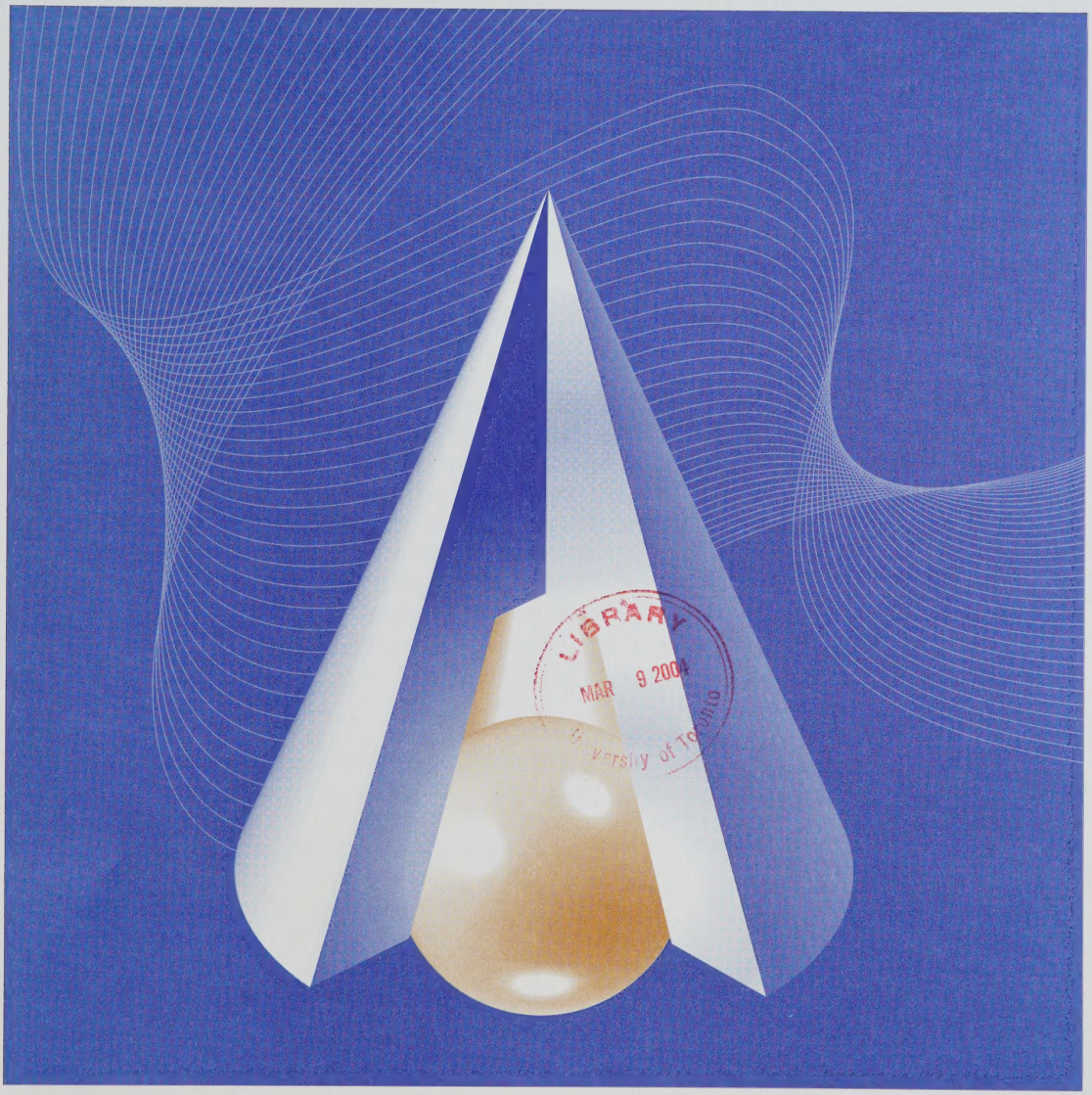

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ABSTRACT

This paper investigates the link between financial structure and employment growth and the link between financial structure and inventory growth, among incorporated Canadian manufacturers over the period 1988 to 1997. It finds that financially vulnerable firms—smaller firms and those with higher leverage—tend to shed more labour than healthier firms for an equal sized drop in product demand. When a demand shock occurs, a firm with high leverage sheds nearly 10% more employment for than a firm with average leverage. The influence was larger during the recession of 1990-1992 and more significant in sectors that were hit hardest by the recession. This is as one would expect given that credit constraints become more binding during recessions. The influence was also larger in sectors that experienced larger cyclical fluctuations. On average, firms with high leverage also tend to cut inventories more (+5%) when a shock in demand occurs.

Keywords: financial accelerator, leverage, firm size, employment, inventory, business cycles.

1. Introduction

To finance operations, firms frequently have to make decisions about the composition of their capital structure. Increase debt? Issue shares? Finance internally? Such questions are not easy to answer because firms must take numerous factors into consideration. The traditional theory beginning with Modigliani and Miller (1958) argued that firms arrived at their optimal capital structure by offsetting the costs of debt and equity. Economic factors, such as inflation, interest rates, and expectations about the future of these, and fiscal factors like corporate and capital taxes each affect the real cost of borrowing, and influence the amount of debt relative to equity present in the firm's capital structure. Additional costs of debt include potential bankruptcy costs, and agency costs associated with the monitoring of investments by bondholders. Costs and benefits of alternate financial sources are "traded off" until the marginal cost of equity equals the marginal cost of debt, yielding the optimal capital structure, and maximizing the value of the firm. The alternative theory, discussed by Meyers (1984) and Fama and French (2002), describes a firm's debt position as the accumulated outcome of past investment and capital decisions. In this theory, commonly called the "Pecking Order" theory, firms with positive net present value investments will finance new investments first using internal funds, and in the absence of internal funds will finance them with safe debt, then risky debt, then with equity, but only if there is no other alternative. Thus, financing investments using internally generated funds may be the cheapest source, and the firm's financial structure is the outcome of past cash flows and investment opportunities.

Regardless of the motive behind using debt, evidence at the macro level suggests that preferences about the optimal capital structure can change over time. During recent decades, Canadian businesses increasingly financed themselves by raising the level of debt with respect to assets—commonly referred to as leverage. Between 1961 and 1996, Canadian firms' capital held in debt increased by nearly 50%[1]. In the 1990s, the level of aggregate corporate leverage tended to fall slightly, but still remained high by historical standards.

Does this increase in leverage matter? Recent studies focusing on the U.S. manufacturing sector have shown that highly leveraged firms have more volatile inventory and employment patterns. In the event of a negative demand shock, firms must find new funds to finance variable inputs. A firm with a healthy balance sheet position may have the cash on hand, or easy access to external finance, to smooth production by building up inventories (Blinder & Maccini (1991)) and avoid the large adjustment costs associated with the firing (and hiring when demand picks up later) of employees (Oi (1962), Nickell (1986)). However, cash flows at highly leveraged firms tend to be committed to principal and interest payments, and lenders may see the firm as having reached its maximum debt capacity. Hence, the cost of additional debt to a financially distressed firm is likely to be high. As a result, leveraged firms will tend to layoff workers (Sharpe (1994)) and allow inventories to decline (Kashyap, Lamont and Stein (1994)), Carpenter, Fazzari and Petersen (1994)). Alternatively, firm owners may prefer higher debt to force firm managers to respond quickly to changes in the economic environment (Jensen (1986, 1988)). In either case, employment and inventory instability is the outcome.

[1] Zyblock (1997) argues that in Canada, this increase in the use of debt to finance expansion was due to two factors: (1) expansion in Western Canada, especially in the energy sector; and (2) a low (in some years negative) real cost of debt, especially in the 1970s. In addition, corporate tax policy had a positive impact on leverage, since interest expenses were deductible from taxable income (Shum (1996)).

Similar arguments have been put forth regarding small firms. Small firms also face capital market constraints since they often do not have access to equity markets, and often need to finance their operations with more expensive bank loans. Thus, small firms are often also seen as financially constrained and more sensitive to demand shocks than large firms (Gertler and Hubbard (1988), Gertler and Gilchrist (1994)).

Interestingly, there is reason to believe that the impact of financial vulnerability on employment and inventory may be larger during recessions. A substantial literature has arisen to describe the so-called "financial accelerator", which is summarized in Bernanke, Gertler and Gilchrist (1996). The basic implications of the financial accelerator can be described as follows. The first is that small firms and firms with unhealthy balance sheets will bear the brunt of deteriorating credit market conditions following a real or monetary shock, because lenders flee away from firms who face significant agency costs of borrowing—a phenomenon referred to as the "flight to quality". Agency costs refer to the higher return necessary for external financing compared to internal financing required to compensate for conflicting incentives facing managers and owners, and the costly monitoring of managerial action. Other things equal, agency costs should be higher when leverage is high and when the firm is small. Reduction in credit available to these firms will exacerbate the problems related to reduced net worth at the firm, causing them to reduce output and investment more than otherwise for a similar demand shock. The second implication is that the reduction in spending and production of credit-constrained firms will spread to other firms, propagating and amplifying the downturn. This suggests a route by which increased debt in the corporate sector may lead to higher macro-economic instability. It is also hypothesized that the influence of financial vulnerability should be greater the deeper the recession (Gertler and Hubbard (1988), Kashyap, Lamont and Stein (1994)).

Bernanke and Gertler (1989) and Calomiris, Orphanides and Sharpe (1994) describe this same phenomenon in terms of "debt deflation". When a shock provokes an unanticipated fall in the general price level, the ensuing reduction in the collateral value of assets decreases the capacity of the firm to raise external funds—or "debt overhang". Firms tend to run up debt during expansions, and are more vulnerable to the effects of debt overhang at cyclical peaks as a result of their high leverage. The literature also raises the possibility that if the macroeconomic shock was the result of a monetary policy to raise the interest rate, this may have an effect on the cost of a leveraged firms' outstanding debt (Bernanke and Blinder (1988)). Higher interest rates also offset the cost a firm incurs in carrying inventory (Kashyap, Lamont and Stein (1994)). Finally, the literature suggests that inflation might be lower than expected during a recession, increasing the real cost of external capital (Bernanke and Campbell (1988); Bernanke and Gertler (1989)).

In this paper, we investigate the empirical association between sales fluctuations and employment and inventory stability for firms with high and low levels of capital market constraints—distinguished by size and leverage. We show that financially vulnerable firms (firms with high agency costs and having high levels of capital constraint) downsize their labour force more in the face of declining product demand than other firms, highly leveraged firms reduce their workforces more in recessions than expansions for an equal sized demand shock, and firms in more cyclical sectors of the economy are affected more than other firms. These results are consistent with the idea that credit market constraints are more binding for these firms, that credit market constraints become more binding during recessions, and that the effect is non-linear and

worsens the deeper the recession. While our results examine both leverage and size, we focus our discussion more on leverage since our sample includes mainly large firms.

In the next section, we discuss some of recent empirical work linking financial vulnerability to the real economic activity of firms, which includes employment, inventories, investment, and R&D spending. The literature generally uses U.S. data, although there are some notable Canadian contributions. In Section 3, we describe our data and model. In Section 4, we describe the empirical relationship between leverage, size and employment fluctuations over the business cycle. In Section 5, we describe the empirical relationship between leverage, size and inventory fluctuations. We are careful to describe our results in correlational terms. One important challenge for this research is to identify the extent to which credit constraints *cause* larger real-side fluctuations. It is equally plausible that firms that are better at downsizing their labour force can attract debt at a more reasonable cost than those that are inefficient at downsizing (in essence arguing that leveraged firms are not credit constrained). In Section 6 of this paper, we discuss the implications of our results and to what extent they indicate a causal association between financial vulnerability and increased business cycle fluctuations in employment and inventories.

2. Background

An extensive review of theoretical and empirical studies connecting financial and real economic activity can be found in Bernanke, Gertler and Gilchrist (1996) or Hubbard (1998). This section reviews research most relevant to the present study, but it is not in any sense an exhaustive review.

Fazzari, Hubbard and Petersen (1988), investigate the link between cash flow and investment behaviour for two classes of fast growing firms: those with low dividend payouts, and those with high dividend payouts. They argue that those firms with high dividend payouts are less likely to be financially constrained (or else they would issue lower dividends). Given the theoretical association between financial vulnerability and real side fluctuations, one would expect to see that fluctuations in cash flow among high dividend payout firms would affect investment less than in low dividend payout firms. The key empirical advancement of this approach was that dividing firms into two classes based *a priori* on their expected financial vulnerability provides a test of the implications of the theory. Even if cash flow is endogenously related to investment, a larger association between cash flow and investment among financially vulnerable firms illustrates the link between financial variables and real-side outcomes. They find that investment is more sensitive to cash flow fluctuations in firms that were *a priori* identified as being more financially vulnerable.

Since Fazzari, Hubbard and Petersen (1988), numerous studies have utilized this classification approach to identify the influence of financial vulnerability. Gertler and Hubbard (1988) and Gertler and Gilchrist (1994) point out that smaller firms may be particularly vulnerable to imperfect capital markets. They suggest that informational frictions that add to the costs of external finance apply proportionately more to small firms because they have relatively limited options available for raising external funds, which is evidenced by their relatively high use of cash flow and bank debt. Other researchers, such as Hoshi, Kashyap and Scharfstein (1991), Schaller (1993), and Chirinko and Schaller (1995) use firm membership in an industrial group to identify firms with lower informational frictions. These latter two papers are also notable in that

they, along with this study and Mentzer (1996) which we discuss below, comprise most of the Canadian literature (that we are aware of) on this subject.

While the studies above examined the impact of credit market constraints on investment, the same arguments can be applied on other "real-side" outcomes. This would include factors that are presumed to be "quasi-fixed" in the long-run—such as employment (Sharpe (1994), Calomiris, Orphanides and Sharpe (1994), Gertler and Hubbard (1988)), as well as highly liquid assets such as inventories (Kashyap Lamont and Stein (1994), Carpenter, Fazzari and Petersen (1994), Calomiris, Orphanides and Sharpe (1994)). Other studies have examined the impact of credit market constraints on R&D (Himmelberg and Petersen (1994)), and mark-ups (Chevalier and Scharfstein (1996)) and market share (Opler and Titman (1994)).

Many studies use exogenous changes in the economy that are expected to affect credit market conditions to identify the influence of credit constraints on real side outcomes. Other things equal, deterioration in credit market conditions will affect credit-constrained firms more than those that are not credit market constrained. Kashyap, Lamont and Stein (1994) and Gertler and Gilchrist (1994) examined inventory investment following periods of tight monetary policy. Zingales (1998) used deregulation in the U.S. trucking industry to identify an exogenous shock in the competitive environment that deteriorated the financial position of existing firms. Zingales found that high leverage significantly decreased the probability of survival. Other studies use fluctuations in the business cycle to identify the influence of financial vulnerability on firm side characteristics (Calomiris, Orphanides and Sharpe (1994), Chevalier and Scharfstein (1996)). According to the financial accelerator theory, smaller firms, and firms with weak balance sheets should experience a relative rise in the cost of external finance and reduce output more in the face of economic downturn. Since recessions are exogenous, so are the resulting shocks to credit markets. Changes in credit markets should affect smaller and more leveraged firms more than other firms, so we should see the employment and inventories of these firms affected more in recession than other firms. A further implication of the financial accelerator is that the effect will be greater the larger the recession. We test this by examining the influence of financial vulnerability on firms in the durables and non-durables manufacturing sectors separately. Since we know that cycles are larger in the durables sector, we would expect the financial accelerator to be more active in this sector.

A few studies have empirically examined the impact of financial vulnerability on employment in a similar manner to this study. Cantor (1990) investigates the impact of sales and cash flow variations on employment and investment growth rates for the U.S. corporate sector. Both sales and cash flow are included to control for the variability of demand, input costs and interests payments. He finds that investment and employment vary positively with sales and cash flow. Interestingly, he also finds that the outcomes vary more for highly leveraged firms. Leverage acts as an important state variable, which conditions a firm's response to demand shocks.

Sharpe (1994) introduced a different model because he argued that the Cantor model did not consider the endogenous aspect of cash flow (cash flow is related to leverage by definition). Sharpe used firm level data and a model that employs the business cycles as an instrument for demand and financial conditions to find a significant relationship between a firm's financial leverage and the cyclicality of its labour force. His results also show that employment growth over the business cycle is more sensitive to demand and financial market imperfections at highly-

leveraged firms, and that the costs of maintaining a firm's labour force over cyclical fluctuations are better borne by larger corporations. Similar conclusions come from Calomiris, Orphanides and Sharpe (1994), which test if the responsiveness in employment, investment and inventory to exogenous changes in sales depend on the leverage of the firm. The results show that leverage and firm size both play an important role in determining the firm's outcomes and that the size and significance of leverage conditioning effects are larger during recessions.

On this side of the border, Mentzer (1996) provides an example of the effects of sales and net income on employment growth using a small sample of Canadian firms, but fails to find any consistent relationship between past profit and the propensity to downsize. He also tests the effect of leverage but similarly could not find a significant relationship, although the size of his sample (from 82 to 122 observations) may have made identification of a significant effect difficult. Other Canadian research from Schaller (1993) and Ng and Schaller (1996) examines the influence of credit constraints on firm investment using a small sample of Canadian firms. The present study is the first Canadian study to examine the implications of financial structure for employment and inventory fluctuations with a large dataset, and is the first Canadian study to examine the cyclical implications of credit constrained firms.

3. Data and Method

We want to know how firms respond to changes in product demand, and whether financially healthy firms respond differently than firms that are financially vulnerable. To do so, we have selected a method already used on several occasions to investigate the impact of leverage in the U.S. manufacturing sector (Calomiris, Orphanides & Sharpe (1994); Sharpe (1994); Cantor (1990)). We briefly explain this method and our data in this section.

The central assumption of our method is that *variations* in employment (or inventory) growth rate depend on *variations* in sales growth and that variations will be larger for firms which we identify *a priori* as more credit constrained, or financially vulnerable to changes in credit market conditions. Thus, we focus on the elasticity of employment (or inventory) with respect to variations in sales for firms classified by their level of leverage and size. Leverage and size, therefore, are introduced into the model as state variables that affect the size of the sales to employment elasticity. (The elasticity is a statistical relationship between two variables that shows to what extent one variable changes when another variable changes.) Employment responses to changes in product demand are estimated using a regression methodology:

$$GEMP_0 = ß_0 + ß_1 GEMP_{-1} + ß_2 GSAL_{0,-1} + ß_3 LEV_{-2} + ß_4 SIZE_{-2} + ß_5\{LEV_{-2} * GSAL_{0,-1}\} + ß_6\{SIZE_{-2} * GSAL_{0,-1}\} \quad (1)$$

The dependent variable ($GEMP_0$) is the employment change within the firm over one year and $GSAL_{0,-1}$ is the average change in sales over the last two years.

The two other important variables are the conditioning influence of leverage on employment elasticity ($LEV_{-2} * GSAL_{0,-1}$) and the conditioning influence of size on employment elasticity ($SIZE_{-2} * GSAL_{0,-1}$). In technical terms, a firm leverage variable and a firm size variable are "interacted" with the firm sales growth variable to produce variation in elasticities for firms having different sizes and leverage ratios. Thus, the estimators related to these two covariates show by how much the elasticity of employment (or inventory) to sales of the firm should be

affected if the firm is above (or under) the average leverage or the average size, all other things being equal. Our central hypothesis argues that this elasticity will be larger for small and highly leveraged firms. Leverage and size are included in twice lagged form to reduce endogeneity associated with simultaneous movements of sales and leverage or size. That is, since leverage and size are measured before the change in sales and employment, then it is less likely that there is a large problem with reverse causality, whereby changes in sales or employment are affecting leverage.

Before estimating the equation, we standardize the leverage and size variables to mean=0 and standard deviation=1. Thus, $ß_2$ is the elasticity of employment with respect to sales for a "typical" firm, with average leverage and average size, $ß_2 + ß_5$ is the elasticity of employment with respect to sales for a firm with average size and leverage one standard deviation above the mean, and so on.

The model also controls for direct effects of leverage (LEV_{-2}) because firms borrow in order to grow, and size ($SIZE_{-2}$) because small firms traditionally grow faster than larger ones. Independent variables also include past employment growth rates ($GEMP_{-1}$), to control for the fact that firms that grew or declined in past periods, may also be likely to do so in the current period. The same model can be applied to estimate fluctuations in inventories – all explanatory variables remain the same, except that $GEMP_{-1}$ is replaced by inventory growth in year t-1.

As we have suggested earlier, the firm's employment response to a change in product demand may be different during periods of economic growth and periods of economic declines due to a reduction in credit available. We follow the lead of several other papers in this literature and use the business cycle to indicate an exogenous change in credit market conditions. If smaller and leveraged firms are more credit constrained, then, in the face of recession, smaller and more leveraged firms should see the cost of finance increase more than their less leveraged counterparts, resulting in a larger decline in output. This hypothesis yields a strategy for identifying the influence of financial vulnerability on employment outcomes, using the recession of 1990-92 as an exogenous change in credit market conditions. We use a close variant of model (1):

$$GEMP_0 = ß_0 + ß_1 GEMP_{-1} + ß_2 PGSAL_{0,-1} + ß_3 NGSAL_{0,-1} + ß_4 LEV_{-2} + ß_5 SIZE_{-2} + ß_6 P\{LEV_{-2} * GSAL_{0,-1}\} + ß_7 N\{LEV_{-2} * GSAL_{0,-1}\} + ß_8 P\{SIZE_{-2} * GSAL_{0,-1}\} + ß_9 N\{SIZE_{-2} * GSAL_{0,-1}\} \quad (2)$$

In this variant, P=1 and N=0 during periods of growth and P=0 and N=1 during periods of decline. Thus, model (2) allows sales elasticity and the conditioning impact of leverage and size to vary with the state of the economy and will be particularly useful to test the assumption that the relation between financial conditions and employment elasticity is stronger during recessions. Unfortunately, model (2) could not be applied to model fluctuations in inventory because inventory data for two recession years are missing (1991 and 1992). Both models have been estimated by using the ordinary least squares method (detailed results are shown in the Appendix).

The models outlined in (1) and (2) represent our first attempt at identifying the influence of financial conditions on employment stability. Using OLS to estimate these models opens the results to the criticism that the results are correlational and not indicative of a causal influence, despite the *a priori* sorting of firms into those we expect to have larger informational frictions

and those with less. In future work, we plan to investigate the possibility of identifying the causal influence of financial vulnerability on employment stability.

Our dataset is constructed from T2 corporate tax records of Canadian firms, linked to Statistics Canada's "Longitudinal Employment Analysis Program" (LEAP) at the individual firm level for the years 1984 to 1998. Variables examined include annual values of assets, equity, sales, inventory and employment for each firm. Assets and equity are measured at book value, sales are measured on a per-year basis, and each of these variables is deflated using the industrial price index. The measure of leverage we employ in this study is one minus equity/assets, which yields the equivalent of liabilities over assets.

The annual measure of employment is an approximation of the labour activity of the firm and is referred to as "average labour units" (ALU). These "units of labour" are computed by taking the total payroll of the enterprise for the year, divided by the average annual income of workers in the corresponding province, size class, and industry (3 digit SIC-level). Therefore, these units must be understood in terms of "standardised labour units" rather than "full-time equivalent workers". However, annual changes in the number of ALUs are similar to annual changes in the number of paid workers estimated by the Labour Force Survey, and can be interpreted as a reliable source of information about labour market activity[2].

Our sample includes all manufacturing firms who reported 50 employees in at least one year between 1984 and 1998. We focus on larger manufacturing firms in order to produce results that are comparable to other work such as Calomiris, Orphanides and Sharpe (1994), and Sharpe (1994). We have also run experiments based on firms which had 25 or more employees in at least one year and found that our conclusions were largely unaffected, although coefficients and standard errors tended to be slightly larger. This would reflect measurement error in estimating employment introduced by the process described above, which is likely to be more important in small firms. In any case, our sample includes mostly relatively large firms. One weakness in related work on this subject, for example Calomiris, Orphanides and Sharpe (1994) and Sharpe (1994) is that their results apply to large publicly traded manufacturing companies. In future work, we plan to investigate the influence of financial vulnerability in other industries and for smaller firms.

In addition, we have included continuing firms with positive counts of ALUs for at least 3 consecutive years because some of the variables of the model are measured in twice lagged form. We consider the year of entry as the first full calendar year of the firm. Similarly, the last year of operation is the most recent calendar year entirely completed by the firm. This method excludes firms in the birth and death years. In the end, we have available nearly 60,000 observations over 10 years for the employment experiment. Firm entry and exit dictates that our sample size varies from year to year, but this gives an average of about 6,000 firms per year.

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[2] More details on LFS-LEAP comparisons of labour measurement can be found in "Developing a Longitudinal Database on Businesses in the Canadian Economy: An Approach to the Study of Employment", Statistics Canada (1988), Catalogue 18-501E.

To compute employment for each firm, we employed the method suggested in Brander, Hendricks, Amit and Whistler (1998), in which E refers to the number of employed individuals on a yearly basis:

$$G_t = (E_t - E_{t-1}) / E^*_t \quad (3)$$

Where $E^*_t = (E_t + E_{t-1}) / 2$ and t refers to time. This rate—which is referred to as the "arc growth rate"—measures growth relative to the average size of the firm during the current and the immediate precedent period. Hence, the value of G_t lies in the interval]-2,2[. This method has the advantage of reducing the undesired impact of outliers; for firms with moderate growth, this method yields similar growth rates to the more standard approach of using the initial year size as the base for calculating a growth rate[3]. Sales and inventory growth are derived in a similar manner. All financial variables were converted to real terms by dividing through the Industrial Price Index.

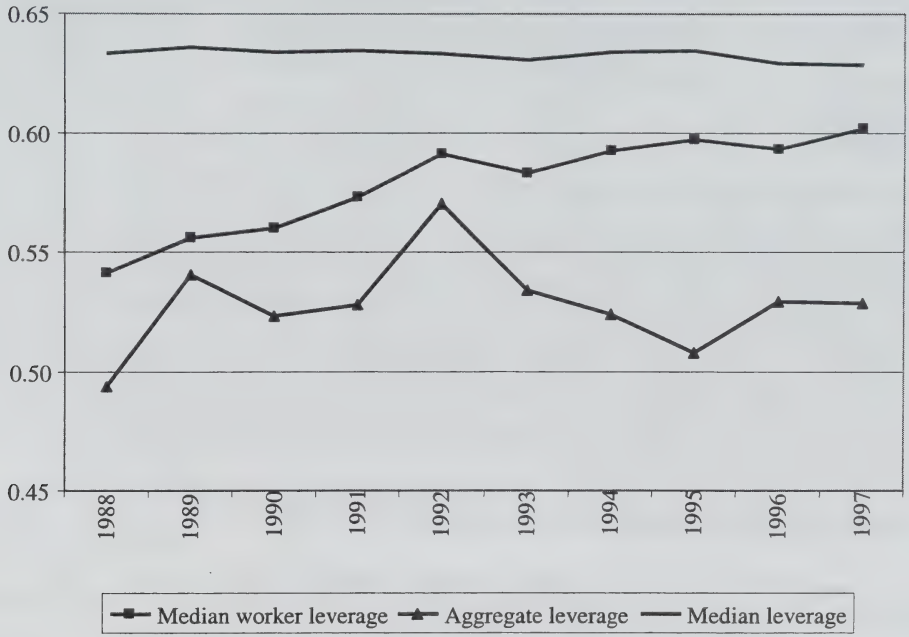
The sample used for the inventory experiment does not include data for the years 1991-1992. Like the employment sample, we included firms with at least 3 consecutive years of positive counts of inventories. Thus, the inventory sample approximately includes 30,000 observations.

4. Firm Leverage over the 1980s and 1990s

Figure 1 shows leverage evaluated in three different ways. Aggregate leverage (the sum of total liabilities divided by total firm assets) rose slightly during the recession years of 1990-1992 but declined sharply afterwards. This is consistent with aggregate results showing that Canadian firms reduced debt in the years following the 1990s recession (Zyblock (1997); The Daily, Wed. March 29, 2000). Nevertheless, other measures of leverage followed different paths. Leverage at the median firm remained relatively constant between 1988 and 1997, at 0.63. More interestingly, the median worker leverage – defined as the median leverage after firms are weighted by their employment size – increased from 0.54 to 0.60 over the same period. This suggests that more workers are employed in highly leveraged firms, and that results on the impact of leverage on employment apply to a non-declining group of workers.

[3] However, the results obtained with conventional growth rates do not yield substantially different results.

Figure 1: Selected indebtedness measures



5. The Relationship between Leverage and Employment

5.1 Leverage and Employment: All Firms, All Years

What is the relationship between leverage and size and the elasticity of employment to sales? To answer this, we estimate model (1). Coefficients are presented in Table A-1 of the Appendix, but for the purposes of this discussion, it is useful to display the results in terms of elasticities. We examine how employment responds to changes in sales under three different situations: (1) the "typical firm" (average leverage and size); (2) the "high-leveraged firm" (average size and high leverage), and (3) the "small firm" (average leverage and small size). High leverage corresponds to a firm located one standard deviation above the average leverage, and a small firm is equivalent to a firm located one standard deviation under the average size. The measure of firm size corresponds to the firm's number of workers.

Table 1: The impact of leverage and size on employment elasticity

	Elasticity of employment to sales for firms with...		
	Average leverage, Average size	High leverage, Average size	Average leverage, Smaller firms
All firms (1988-97)	0.392	0.428 (+9.2%)	0.479 (+22.2%)

We first examine the impact of leverage and size on employment growth. Table 1 shows the elasticity of employment for the three types of firms. For a firm with average leverage and average size, the elasticity of employment to sales is 0.392, indicating that such a firm would respond to a 10 percent drop in sales by cutting employment by 3.92 percent. Do firms with more leverage and smaller firms downsize more in the face of declining product demand? Firms with high leverage have an elasticity of 0.428, indicating that such firms would drop 4.28% of their workforce in the face of a 10% decline in product demand. This elasticity was 9.2% larger than that of an average firm, indicating a considerable impact of leverage on the responses of firms to demand shocks. Smaller firms have an even higher employment elasticity of 0.479, which is 22.2% higher than a firm with average size.

5.2 Leverage and Employment over the Business Cycle

Above we suggested that the relationship between financial vulnerability and employment growth and decline should also be larger in recession than recoveries because credit constraints become more binding in recession. To examine this question, we estimate model (2) and report the results in terms of elasticities in the manner described above (complete results for model (2) are presented in Table A-2 of the Appendix).

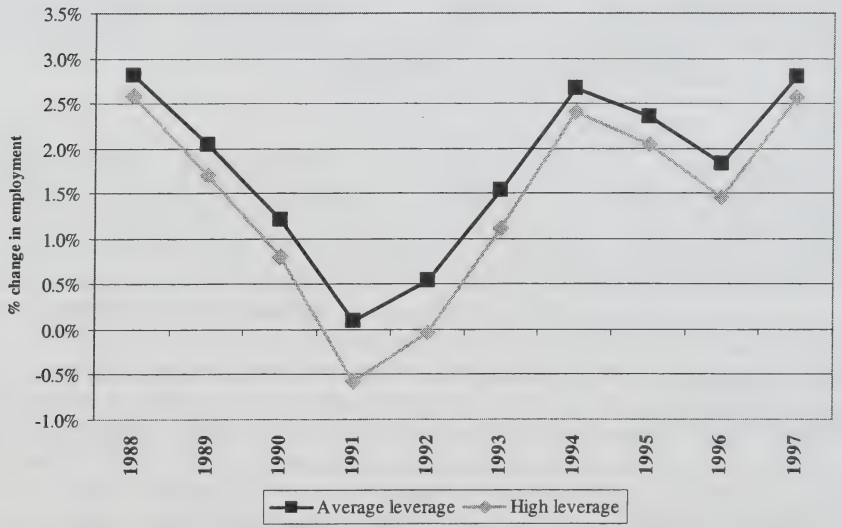
These results are introduced in Table 2 and show that the impact of leverage is not the same across the business cycles. During years of expansion and recovery, leverage raises the elasticity of sales on employment growth by 7.7%, but the same effect surges to 11.8% during periods of economic downturns—meaning that highly leveraged firms reduce employment more in response to a shock in sales during recession than expansion. Employment growth responds more to changes in sales in small firms (+23.8% in expansion and 19.8% in recovery), which suggests that larger firms dampen fluctuations in employment relative to demand more effectively than smaller firms. However, the "size factor" does not vary significantly along with changing economic conditions. The 23.8% increase in the expansion and the 19.8% increase in the recovery are not statistically different from one another. These findings are consistent with the financial accelerator theory described above. Firms which we have *a priori* identified as having restricted access to external markets, in this case highly leveraged firms, see their sales elasticity rise in recession relative to those which were not *a priori* identified as being financially constrained. We did not find that the sales elasticity rose proportionately more in smaller firms, which we also expect to be financially constrained during recession, but this may reflect the fact that firms in our sample are, at 50 or more employees, relatively large.

Table 2: Impact of leverage and size on employment elasticity over the business cycle

	Elasticity of employment to sales for firms with...		
	Average leverage, Average size	High leverage, Average size	Average leverage, Smaller firms
Expansion (1988-89, 1993-97)	0.378	0.407 (+7.7%)	0.468 (+23.8%)
Recession (1990-92)	0.424	0.474 (+11.8%)	0.508 (+19.8%)

Figure 2 provides a graphic illustration of the changing impact of leverage over the business cycle. From the results obtained with our estimation method, we can generate the predicted employment growth of a "typical" firm (with average leverage, average size, and annual sales growth set at the average for all manufacturers in our sample) over the years 1988 to 1997 (top curve). We also generate predicted employment growth for firms above the average leverage (bottom curve)[4]. From 1988 to 1991 – a period corresponding to declining employment growth rates – the "average" firm experienced a drop in employment growth from 2.8% to 0.1% (down 2.7%), whereas highly leveraged firms experienced a larger drop, from 2.6% to –0.6% (down 3.2%). At first glance, such numbers might appear small. However, in this example, a highly leveraged firm reduced employment by about 15% more than the average firm, which is a significant difference.

Figure 2: The cyclical path of average and high-leveraged firms



[4] Firms above the average leverage in Figure 2 are the equivalent of a firm surpassing the average leverage by two times the standard deviation.

5.3 Leverage and Employment in Durables and Non-Durables Industries

Table 3 shows results for two sub-divisions of the manufacturing sector: firms producing durable goods, and firms producing non-durable goods. The rationale of doing so is that the impact of financial constraints may be felt differently across various industrial groups because the magnitude of cyclical fluctuations is not the same across all industries. The financial accelerator theory suggests that the influence of credit market constraints will be felt more, the deeper the recession. Since we know that recessions are deeper in the durables sector of manufacturing, we can classify firms according to whether they are in the sector we expect to be more credit constrained in the event of a downturn, and examine the differential impact on employment. In fact, the elasticity of employment to sales of a typical firm in both sectors is also relatively different, from 0.411 for durables to 0.377 for non-durables (see Tables A-1 and A-2 of the appendix for detailed regression results). Another reason for examining industry sectors is that what matters might be your financial vulnerability relative to others in your industry (Campello (2003)).

Table 3: The impact of leverage and size on employment elasticity over the business cycle

	Elasticity of employment to sales for firms with…		
	Average leverage, Average size	High leverage, Average size	Average leverage, Smaller firms
Durables			
All firms (1988-97)	0.411	0.427 (+3.9%)	0.503 (+22.4%)
Expansion (1988-89, 1993-94)	0.395	0.403 (+2.0%)	0.492 (+24.6%)
Recession (1990-92)	0.447	0.484 (+8.3%)	0.529 (+18.3%)
Non-Durables			
All firms (1988-97)	0.377	0.427 (+13.3%)	0.460 (+22.0%)
Expansion (1988-89, 1993-94)	0.363	0.409 (+12.7%)	0.445 (+22.6%)
Recession (1990-92)	0.408	0.468 (+14.7%)	0.494 (+21.1%)

It appears that the impact of high leverage on employment elasticity differs across the two sectors: at 13.3%, the overall impact of leverage on employment elasticity is stronger for non-durables than for durables (+3.9%). However, the results obtained for durables demonstrate that leverage has a significantly greater conditioning impact on employment growth during recessions (+8.3%), because the link between employment growth and leverage is much smaller in expansions (+2.0%). This is not the case for firms producing non-durables, in which the effect of leverage does not differ significantly across the business cycle. As indicated above, cycles are larger in the durables sector, which may result in more strongly binding constraints during recessions than those in the non-durables sector.

In both sectors, the effect of firm size is still significant but does not vary significantly across the industrial sectors and across the economic cycles. Smaller firms have higher employment fluctuations by 18% to 25%, depending of the economic context or the sector in which the firm operates; however, these differences were not statistically significant from one another. In other words, being large strongly enhances the capacity of the firm to dampen employment fluctuations in the two broadest industrial categories, and the impact of size has no specific business cycle effects.

6. The Relationship between Leverage and Inventories

6.1 Leverage and Inventories: All firms, All years

In this section, we examine the impact of leverage on inventory fluctuations. As mentioned earlier, the inventory sample contains data only for the periods 1988-1990 and 1993-1997, which does not allow a complete analysis of the effects of leverage and size over the business cycle. Therefore, we discuss only the results of model (1). Results of model (1) for inventories are available in Table A-3 of the Appendix.

According to Table 4, the elasticity of inventory to sales is 0.997 for firms with average leverage and average size, which suggests that fluctuations in sales and inventory move almost perfectly with each other. The results also demonstrate that inventories are much more responsive than employment to fluctuations in sales, as expected.

Table 4: The impact of leverage and size on inventory elasticity

	Elasticity of inventory to sales for firms with…		
	Average leverage, Average size	High leverage, Average size	Average leverage, Smaller firms
All firms	0.997	1.045 (+4.8%)	0.963 (-3.5%)

Interestingly, leverage also has a small but significant impact on the close relationship between sales and inventory changes. Firms that are one standard deviation above the standard leverage increase their elasticity of inventory to sales by 4.8%, which suggest that firms with heavier debt loads rely more on short-term assets to finance themselves.

Firm size has a very minor impact on inventory changes. In smaller-than-average firms, the relationship between sales and inventory growth is only 3.5% smaller than in firms of average size, which shows that size matters much more for employment volatility than for inventory fluctuations.

6.2 Leverage and Inventory, Durables and Non-Durables Industries

According to Table 5, the elasticities of inventory to sales are 0.947 and 1.041 for durables and non-durables respectively. Interestingly, the conditional impact of leverage is estimated at 8.0%

in the non-durables sector, but has also no impact in durables industries—possibly because inventories are generally easier to liquidate in non-durables industries. Our results also suggest that inventory changes of durable goods may not be influenced by leverage at all.

Table 5: The impact of leverage and size on inventory elasticity, durables and non-durables

	Elasticity of inventory to sales for firms with…		
	Average leverage, Average size	High leverage, Average size	Average leverage, Smaller firms
Durables	0.947	0.952 (+0.5%)	0.897 (-5.3%)
Non-Durables	1.041	1.124 (+8.0%)	1.019 (-2.1%)

However, size appears to have an impact on the relationship between sales and inventory growth in durables industries, but not necessarily in non-durables. In durables industries, inventory responds 5.3% less to changes in sales in smaller firms than in average sized firms.

7. Discussion

In the preceding two sections, we examined the relationship between sales and employment for firms that we *a priori* identify as being financially constrained and not financially constrained. We find, in accordance with the theory, that the elasticity of employment with respect to sales is larger for those firms that we expect to have higher agency costs, specifically smaller (+22.2%) and highly-leveraged firms (+9.2%). The same theory suggests that agency costs rise more for financially constrained firms during recession, which we also find evidence for. Employment elasticities at highly-leveraged firms were found to increase by 11.8% with the onset of recession, compared to 7.7% during expansion. Finally, theory suggests that the deeper the recession, the larger the influence of financial vulnerability. We find in accordance with this theory that the employment elasticity of financially constrained durables manufacturers (a more cyclical industry sector) rose more than 4 times faster during recession than expansion, compared to the non-durables sector which rose only slightly faster in recession. This confirms most of the major predictions of the financial accelerator model, suggesting that increased leverage in the corporate sector has affected employment stability. Our results appear more binding in the case of leverage than firm size, which might be because our sample includes only firms with more than 50 employees.

We cannot be definitive about this result, since there remains a potential that our results could be generated by reverse causality. It could be that our main instrument for financial instability—corporate leverage—may be in fact the result of employment instability. That is, unstable employment causes firms to have a higher leverage position. This could occur if lenders see firms that quickly shed labour in the event of a shock to product demand as being more credit worthy. This explanation also implies that highly-leveraged firms are not credit constrained. However, under this assumption, it is not easy to explain why such firms would downsize their employment

faster in recession. If such firms were not credit constrained, then in the event of a recession, they would not face a relative reduction in credit, and would not need to lay off even more workers for an equal sized sales shock. Hence, our results describing increased elasticities in recession for such firms are consistent with the financial accelerator hypothesis, but not the alternative hypothesis described above. Furthermore, it does not help us to explain why the employment to sales elasticity rose more in the sector that took a larger downturn in the 1990s recession. If these firms were not credit constrained, as argued by the alternative hypothesis, then one would not have expected to see these firms downsize more during a recession than during an expansion for an equal sized demand shock.

The main implication of these results is that increased financial instability, related to more corporate leverage, may have increased employment instability by an important margin. While we do not know why corporate leverage increased so much in Canada over past decades, theory suggests that this may have raised the financial vulnerability of the corporate sector in Canada, which has in turn affected the stability of employment. As noted in the introduction, Jensen (1986, 1989) has argued that firm owners may prefer higher debt in their capital structure in order to cash constrain their managers, and force them to react quickly in the face of changing economic conditions. If our results can be interpreted causally, then the increased financial instability in firms may have resulted in shifting some of the risk of business from the owners of firms to the employees.

There are also important potential macroeconomic consequences to increased debt. Researchers have argued that the recession of the 1990s was deeper and longer than previous recessions in part because of the high level of debt held by firms (Calomiris, Orphanides and Sharpe (1994)). This high debt severely limited the options available to firms who, in order to survive, may have had to downsize more than otherwise. This paper finds empirical evidence that high levels of corporate debt were in fact related to increased levels of job destruction, and that this was particularly evident during the 1990 to 1992 period. This interpretation is also supported by the fact that higher debt levels were associated with more volatile inventory changes.

Appendix

A-1: Regression Results for Model (1) – Leverage and Employment

Model	All Firms	Durables	Non durables
Constant	0.006* (0.001)	0.008* (0.002)	0.005* (0.001)
Lag employment growth rate	-0.123* (0.004)	-0.133* (0.006)	-0.114* (0.005)
2nd lag of leverage	-0.003* (0.001)	-0.004* (0.002)	-0.003 (0.001)
2nd lag of firm size	-0.035* (0.001)	-0.036* (0.002)	-0.033* (0.001)
Current and lagged sales growth	0.392* (0.004)	0.411* (0.007)	0.377* (0.006)
Current and lagged sales growth * 2nd lag of leverage	0.036* (0.003)	0.016* (0.005)	0.050* (0.004)
Current and lagged sales growth * 2nd lag of firm size	-0.087* (0.003)	-0.092* (0.005)	-0.083* (0.005)
Number of observations	59,370	24,910	34,460

* significant at the 5% level

A-2: Regression Results for Model (2) – Leverage and Employment

Model	All Firms	Durables	Non durables
Constant	0.007* (0.001)	0.008* (0.002)	0.005* (0.001)
Lag employment growth rate	-0.123* (0.004)	-0.134* (0.006)	-0.114* (0.005)
2nd lag of leverage	-0.003* (0.001)	-0.003* (0.002)	-0.003 (0.001)
2nd lag of firm size	-0.034* (0.001)	-0.036* (0.002)	-0.033* (0.001)
Current and lagged sales growth: expansion	0.378* (0.005)	0.395* (0.008)	0.363* (0.007)
Current and lagged sales growth: recession	0.424* (0.008)	0.447* (0.012)	0.408* (0.010)
Current and lagged sales growth * 2nd lag of leverage: expansion	0.029* (0.004)	0.008 (0.006)	0.046* (0.005)
Current and lagged sales growth * 2nd lag of leverage: recession	0.050* (0.006)	0.037* (0.010)	0.060* (0.008)
Current and lagged sales growth * 2nd lag of firm size: expansion	-0.090* (0.004)	-0.097* (0.006)	-0.082* (0.005)
Current and lagged sales growth * 2nd lag of firm size: recession	-0.084* (0.006)	-0.082* (0.009)	-0.086* (0.007)
Number of observations	59,370	24,910	34,460

* significant at the 5% level

A-3: Regression Results for Model (1) – Leverage and Inventory

Model	All Firms	Durables	Non durables
Constant	0.007* (0.003)	0.007 (0.005)	-0.007 (0.004)
Lag inventory growth rate	-0.392* (0.005)	-0.386* (0.008)	-0.399* (0.007)
2nd lag of leverage	-0.013* (0.003)	-0.014* (0.005)	-0.012* (0.004)
2nd lag of firm size	-0.017* (0.003)	-0.025* (0.005)	-0.011* (0.004)
Current and lagged sales growth	0.997* (0.012)	0.947* (0.019)	1.041* (0.016)
Current and lagged sales growth * 2nd lag of leverage	0.048* (0.009)	0.005 (0.015)	0.083* (0.012)
Current and lagged sales growth * 2nd lag of firm size	0.034* (0.009)	0.050* (0.014)	0.022 (0.012)
Number of observations	29,508	12,348	17,160

* significant at the 5% level

A-4: Classification of manufacturing industries*

SIC-E	Classification	Observations	% of sample
10: Food	Non-durables	6,015	10.1
11: Beverage	Non-durables	503	0.8
12: Tobacco products	Non-durables	55	0.1
15: Rubber products	Non-durables	478	0.8
16: Plastic products	Non-durables	2,631	4.4
17: Leather and allied products	Non-durables	598	1.0
18: Primary textile	Non-durables	478	0.8
19: Textile products	Non-durables	1,518	2.6
24: Clothing	Non-durables	5,553	9.4
25: Wood	Non-durables	5,231	8.8
26: Furniture and fixture	Non-durables	2,737	4.6
27: Paper and allied products	Non-durables	1,595	2.7
28: Printing, publishing and allied industries	Non-durables	4,676	7.9
29: Primary metal	Durables	1,283	2.2
30: Fabricated metal products	Durables	8,249	13.9
31: Machinery	Durables	4,171	7.0
32: Transportation equipment	Durables	3,315	5.6
33: Electrical and electronic products	Durables	2,952	5.0
35: Non-metallic mineral products	Durables	1,769	3.0
36: Refined petroleum and coal products	Non-durables	201	0.3
37: Chemical and chemical products	Non-durables	2,191	3.7
39: Other manufacturing	Durables	3,171	5.3
All industries	-	59,370	100.0

*Source: Standards Division, Statistics Canada.

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